

9 Jun 1992

TSMNN-C  
TEST SET, RADIO

**1. GENERAL.** This procurement requires a portable radio test set for use with radio receiving and transmitting equipment.

**2. CLASSIFICATION.** Type II, Class 3, Style C, and Color R in accordance with MIL-T-28800 for shipboard applications.

**3. FUNCTIONAL REQUIREMENTS.** The equipment shall be capable of signal generation, monitoring, amplitude level and frequency measurement, power measurement, modulation analysis, and receiver signal-to-noise measurement, within the minimum specifications identified below.

**3.1 RF signal generator.**

**3.1.1 Generator frequency range.** 400 kHz to 999.99 MHz tuneable in increments of 100 Hz.

**3.1.2 Generator frequency accuracy.** Equal to time base accuracy (see 3.10).

**3.1.3 Residual FM.** 100 Hz rms from 300 Hz to 3 kHz.

**3.1.4 Generator output power.** Continuously adjustable from -127 dBm to -20 dBm. Accuracy:  $\pm 4$  dB.

**3.1.5 Generator spectral purity.** -15 dBc for harmonics, -35 dBc for all other spurious signals.

**3.1.6 Modulation.** FM and AM from internal source, external source, and supplied microphone.

**3.1.6.1 Frequency modulation.**

**3.1.6.1.1 Modulation deviation.** 0 to 25 kHz peak from 400 kHz to 999.99 MHz.

**3.1.6.1.2 Modulation frequency response.** 20 Hz to 10 kHz.

**3.1.6.2 Amplitude modulation.**

**3.1.6.2.1 AM frequency response.** 100 Hz to 10 kHz from 400 kHz to 999.99 MHz.

**3.1.6.2.2 Percentage of modulation range.** 0 to 95% with modulating frequencies from 100 Hz to 10 kHz.

**3.2 RF signal analyzer.**

**3.2.1 Analyzer frequency range.** 400 kHz to 999.99 MHz.

**3.2.2 RF analyzer input sensitivity.** 5 mW or less.

**3.2.3 Beat frequency oscillator.** A beat frequency oscillator that provides an audible carrier indication shall be provided.

**3.2.4 RF frequency error measurement.** The analyzer shall indicate the difference in frequency of the RF signal under test and a predetermined value entered by the operator.

## TSMNN-C

**3.2.4.1 RF frequency error measurement accuracy.** Equal to time base accuracy  $\pm 1$  Hz.

**3.2.4.2 RF frequency error measurement resolution.** 10 Hz or less.

**3.2.5 Analyzer FM deviation range.** 0 to 25 kHz peak deviation. Accuracy:  $\pm 7.5\%$  plus the peak residual FM at modulation frequencies of 30 Hz to 10 kHz.

**3.2.5.1 FM input sensitivity.** For 10 dB EIA SINAD: 5.0  $\mu$ V.

**3.2.6 Analyzer AM percentage range.** 0 to 100%. Accuracy:  $\pm 8\%$  FS +1 LSD at modulation frequencies of 300 Hz to 10 kHz.

**3.2.7 Signal strength measurement.** A means shall be provided to measure the relative level of off-the-air signals received by an antenna supplied with the instrument.

a. Frequency range: 3 MHz to 999.99 MHz.

b. Level range. -100 dBm to +10 dBm.

**3.3 RF wattmeter.** An RF wattmeter and load shall be provided to measure the power generated by units under test at frequencies above 1.5 MHz, and to terminate a 50-ohm system with an SWR of 1.5 or less.

a. Power range. 1 mW to 60W.

b. Accuracy.  $\pm 10\%$  of indication.

c. Load. The RF load shall be capable of terminating 100W for at least one minute.

**3.3.1 Wattmeter over-temperature protection.** Visual and audible over-temperature warnings shall be provided.

**3.4 Duplex generator.** A duplex generator function or other means shall be provided to test equipment transmitting and receiving simultaneously on offset frequencies.

**3.4.1 Duplex frequency offset.** 0 to  $\pm 10$  MHz with a resolution of 10 kHz.

**3.4.2 Duplex output level.** -50 dBm minimum into a 50-ohm load.

**3.4.3 Duplex generator deviation.** The carrier shall be capable of being frequency modulated at deviations from 0 to 20 kHz peak.

**3.4.4 Duplex generator frequency response.** 20 Hz to 10 kHz at 3 dB.

**3.4.5 Sensitivity.** In duplex mode, the equipment shall operate properly with input levels of 20 mW or less.

**3.5 Oscilloscope.** An oscilloscope function shall be provided to monitor the modulation characteristics of AM and FM signals.

**3.5.1 Oscilloscope display size.** At least five square inches.

**3.5.2 Oscilloscope frequency response.** DC to 20 kHz.

## TSMNN-C

**3.5.3 Oscilloscope vertical input ranges.** 10 mV to 10 V/div.

**3.5.4 Oscilloscope horizontal sweep rate.** 100 us/div to 20 ms/div.

## TSMNN-C

**3.6 AF frequency measurement.** A frequency counter function shall be provided to measure audio frequencies.

**3.6.1 AF frequency measurement range.** 20 Hz to 20 kHz with a resolution of 1 Hz. Accuracy:  $\pm 2$  counts.

**3.7 AF signal generator.** An audio frequency signal generator shall be provided to generate the tones required by various two-tone signaling systems.

**3.7.1 AF generator frequency range.** 10 Hz to 20 kHz with a resolution of 1 Hz.

**3.7.2 AF generator output level.** 2.5 Vrms minimum into 600 ohms.

**3.8 SINAD meter.** A means shall be provided to measure the sensitivity of a receiver with respect to the ratio of the signal plus noise and distortion to noise and distortion.

**3.8.1 SINAD meter frequency.** The equipment shall provide a test signal modulated by 1 kHz to the receiver under test.

**3.8.2 SINAD meter input range.** 0.1 Vrms to 10 Vrms.

**3.8.3 SINAD meter measurement range.** 1 dB to 50 dB. Accuracy:  $\pm 1.5$  dB at 12 dB SINAD.

**3.9 Distortion measurements.**

**3.9.1 Fundamental frequency.** 1 kHz nominal.

**3.9.2 Level range.** 50 mVrms to 10 Vrms.

**3.9.3 Distortion range.** 0.1% to 20%.

**3.9.4 Accuracy.**  $\pm 1.5$  dB.

**3.10 AF voltmeter.** An AF voltmeter shall be provided for DC and AC voltage measurements.

**3.10.1 AC measurements.**

**3.10.1.1 Frequency range.** 50 Hz to 20 kHz.

**3.10.1.2 Level range.** 0 to 30 Vrms.

**3.10.1.3 Accuracy.**  $\pm(3\% \text{ iv} + 3 \text{ mV} + 1 \text{ LSD})$ .

**3.10.2 DC measurements.**

**3.10.2.1 Level range.** 0 to 40V.

**3.10.2.2 Accuracy.**  $\pm(1\% \text{ iv} + 50 \text{ mV})$ .

**3.11 Time base accuracy.** 2 ppm.

**3.11.1 Time base aging.**  $\pm 2$  ppm per year.

TSMNN-C

**3.11.2 Time base temperature stability.** 0 to 55°C:  $\pm 1$  ppm.

**3.12 Loudspeaker.** The equipment shall contain an internal loudspeaker.

#### **4. GENERAL REQUIREMENTS.**

**4.1 Power source.** MIL-T-28800 nominal and dc external power source requirements are invoked as detailed below.

**4.1.1 Nominal power source.** Maximum power consumption: 300W.

**4.1.2 DC external power source.** 11-18 Vdc, 120W maximum. The equipment shall be provided with a DC power cord for connecting to external DC sources.

**4.2 Weight.** 21 kg (46 lb) maximum.

**4.3 Digital interface.** The equipment shall be provided with a digital interface in accordance with MIL-T-28800.

**4.4 Lithium batteries.** Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

**4.5 Accessories.** For audio analysis the equipment shall be provided with a 600-ohm input impedance or a 600-ohm balanced interface as an accessory.